Abstracts

A temperature-dependent nonlinear analysis of GaN/AlGaN HEMTs using Volterra series

A. Ahmed, S.S. Islam and A.F.M. Anwar. "A temperature-dependent nonlinear analysis of GaN/AlGaN HEMTs using Volterra series." 2001 Transactions on Microwave Theory and Techniques 49.9 (Sep. 2001 [T-MTT] (Mini-Special Issue on the 2001 IEEE Radio Frequency Integrated Circuit (RFIC) Symposium)): 1518-1524.

Gain and intermodulation distortion of an AlGaN/GaN device operating at RF have been analyzed using a general Volterra series representation. The circuit model to represent the GaN FET is obtained from a physics-based analysis. Theoretical current-voltage characteristics are in excellent agreement with the experimental data. For a 1 /spl mu/m/spl times/500 /spl mu/m Al/sub 0.15/Ga/sub 0.85/N/GaN FET, the calculated output power, power-added efficiency, and gain are 25 dBm, 13%, and 10.1 dB, respectively, at 15-dBm input power, and are in excellent agreement with experimental data. The output referred third-order intercept point (OIP/sub 3/) is 39.9 dBm at 350 K and 33 dBm at 650 K. These are in agreement with the simulated results from Cadence, which are 39.34 and 35.7 dBm, respectively. At 3 GHz, third-order intermodulation distortion IM/sub 3/ for 10-dBm output power is -72 dB at 300 K and -56 dB at 600 K. At 300 K, IM/sub 3/ is -66 dB at 5 GHz and -51 dB at 10 GHz. For the same frequencies, IM/sub 3/ increases to -49.3 and -40 dB, respectively, at 600 K.

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